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Case Report

Novel use of a guiding catheter to relieve left main stem occlusion complicating Stamford type A aortic dissection

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SUMMARY

Acute ST elevation myocardial infarction occurring as a result of acute aortic dissection is a relatively rare complication with an incidence of 1–2%. However, despite this the outcome is frequently fatal.

This report documents novel use of a percutaneous guiding catheter to relieve left main stem occlusion complicating Stamford type A aortic dissection, as a bridge to successful surgical treatment.

A 62-year-old man presented with acute chest pain and electrocardiographic changes consistent with acute anterior myocardial infarction, and was sent for primary percutaneous coronary intervention. Angiography demonstrated an acute Stamford type A aortic dissection with associated secondary myocardial infarction caused by mechanical obstruction of the left main coronary artery by the dissection flap. Engagement of the coronary ostium with a guide catheter relieved the obstruction and allowed transfer of the patient to the operating theatre where surgery was successfully performed.

Introduction

Acute aortic dissection occurs when blood flow separates the layers of the aortic intima and media [1].

Stamford type A acute ascending aortic dissection associated with acute myocardial infarction (AMI) is rare, with a reported incidence of 1–2% [2,3].

Ischemia occurs as a result of either obstruction of the orifice of coronary arteries by a dissection flap or intussusception of the circumferentially disrupted inner layers of the aortic wall [4]. The right coronary artery (RCA) is more often affected than the left coronary artery [5].

When an AMI complicates aortic dissection, the symptoms of the primary aortic dissection may be obscured by those of myocardial ischaemia.

Involvement of the coronary ostia with resultant secondary acute myocardial infarction is usually fatal, particularly when the left main stem (LMS) is involved [6].

We report a case where activation of a primary angioplasty pathway resulted in prompt diagnosis of the underlying pathology, and percutaneous intervention allowed stabilization of the patient, facilitating successful surgery.

Case report

A 62-year-old previously fit and well male, on no regular medication and with no relevant cardiac risk factors presented to the emergency department with a 90 minute history of acute central chest pain (CP) and an electrocardiogram (ECG) demonstrating significant antero-lateral ST segment elevation.

Clinical examination revealed him to be sweaty, diaphoretic, and hypotensive with a systolic blood pressure of 60 mmHg.

As per protocol the primary percutaneous angioplasty (PPCI) pathway was activated. He had been given aspirin 300 mg and clopidogrel 300 mg pre-hospital, and transferred immediately to the cardiac catheter laboratory for urgent treatment of presumed acute anterior ST elevation myocardial infarction. A further 300 mg of clopidogrel was given on entering the catheter laboratory.

Vascular access was obtained via the femoral approach. Using a 6F guiding system a Judkins Right 4 diagnostic catheter (Cordis Corporation, Miami, FL, USA) was advanced without difficulty into the aortic root and demonstrated a large dominant normal RCA (Fig. 1). An EBU 3.5 guide catheter (Medtronic, Minneapolis, MN, USA) was then passed into the root over an exchange length 0.035′ in. wire.

After failure of manipulation of the EBU 3.5 guiding catheter to engage the LMS, testing injections of contrast demonstrated extensive staining and a linear flap involving the aortic root (Fig. 2), suggesting the diagnosis of acute type A aortic dissection.

Failure to engage the LMS suggested that the dissection flap and concomitant aortic hematoma were overlying the ostium of the vessel.

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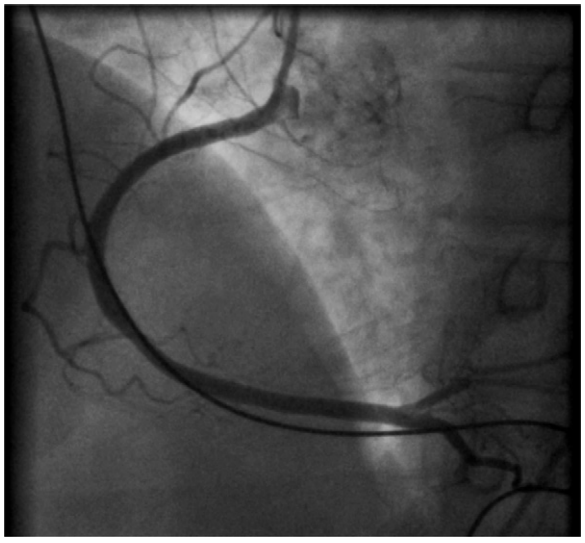

Fig. 1. Normal right coronary artery.

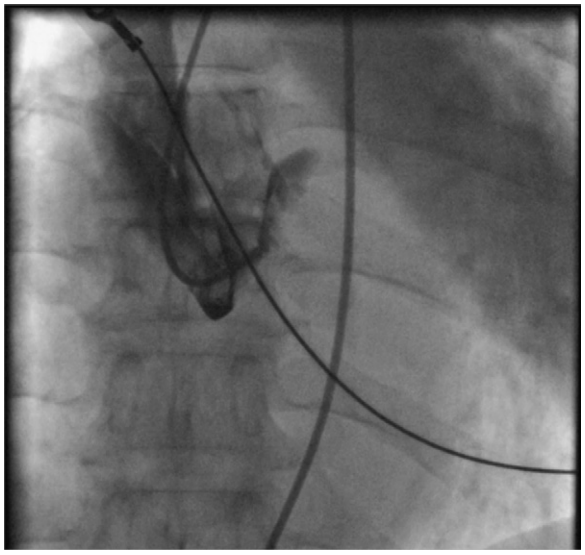

Fig. 2. EBU 3.5 Guide catheter in the aortic root demonstrating extensive contrast staining, and a visible linear flap in the aortic root.

Subsequent clockwise rotation of the catheter allowed selective cannulation of the LMS, relieving the ostial compression (Fig. 3) restoring antegrade flow.

Hemodynamic status improved immediately after full catheter engagement of the LMS.

The patient's symptoms of CP were also relieved with resolution of the ST segments to baseline.

A BMW universal 0.014″ guidewire (Abbott Vascular, Abbott Park, IL, USA) was passed to the distal left anterior descending artery to secure guide catheter stability. The patient was transferred immediately to theatre with the wire and guide catheter in situ. Systemic heparin was not administered.

On the table transesophageal echocardiography performed immediately before surgery under general anesthesia confirmed an extensive dissection flap in the ascending aorta (Fig. 4). The aortic valve leaflets were not disrupted and there was no significant aortic regurgitation (AR). There was a minor degree of anterior wall hypokinesia.

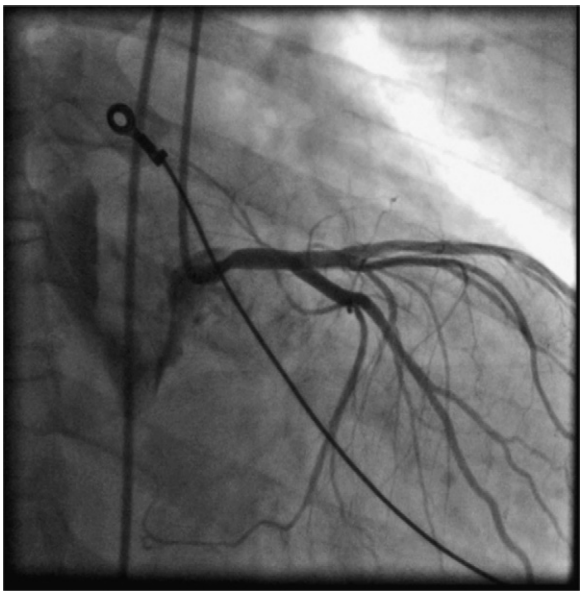

Fig. 3. Engagement of the left main stem with an EBU 3.5 guide demonstrating relief of the ostial compression from the dissection flap hematoma and a subsequent normal left coronary system.

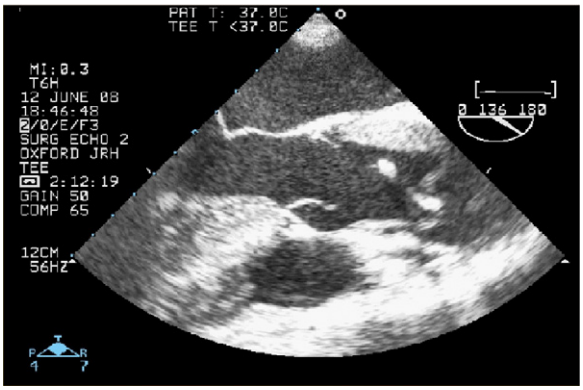

Fig. 4. Transesophageal echocardiography long-axis view with dissection flap visible in root and guide catheter in situ.

At operation the intimal tear was identified in the distal ascending aortic root. The aortic valve and coronary ostia appeared morphologically normal. The ascending aorta was excised and replaced with a polytetrafluoroethylene interposition graft.

The patient was transferred to the cardiothoracic intensive care unit for further monitoring and recuperation. He was extubated after 24 h. He remained in sinus rhythm throughout the post-operative period and bedside echocardiography at 48 h revealed no significant AR, with preserved ejection fraction, with minor anterior wall hypokinesia only.

His post-operative course was uncomplicated and he was discharged at day 12.

He has since been followed up in outpatients, having made a full recovery.

Discussion

There are a number of important learning points from this case.

Firstly, aortic dissection may be uncommon but it is associated with a very high mortality. As in this case, Type A aortic dissection

retains a mortality estimated at about 35% for both medically and surgically treated cases [7].

The incidence of aortic dissection has been estimated at 5–30 per 1 million people per year, relative to an incidence that has been estimated at 4400 per 1 million per year for AMI in the USA [8].

Rarely do the two present together, and differentiating aortic dissection from myocardial ischemia is a common clinical dilemma, and because the therapeutic strategy is very different, rapid, accurate diagnosis is essential [9,10].

In this case, access to a PPCI care pathway enabled prompt identification of the aortic dissection, and also allowed treatment of the complicating AMI, as a bridge to definitive emergency surgical treatment.

This highlights how important a PPCI service is. Prior to 24 h a day, 7 days a week primary angioplasty service this patient would have been treated incorrectly with thrombolysis for his anterior MI, and there is little doubt that this would have prevented surgical treatment and most likely led to significant risk of bleeding and death.

Secondly, contrast aortography has now been superseded as the "gold standard" imaging technique for diagnosing aortic dissection. The sensitivity and specificity of aortography are inferior to less invasive imaging modalities such as contrast computed tomography and magnetic resonance imaging [11,12] due to difficulty in determining the false lumen from the true lumen and failure to identify intramural hematomas [13].

However, its greatest and unique advantage is that it offers excellent visualisation of the coronary arteries, and in this particular case allowed treatment of a potentially life-threatening complication of type A dissection. Therefore if the clinical diagnosis suggests the possibility of combined aortic dissection and MI, then coronary angiography and aortography should be considered as the imaging modality of choice.

In this particular case, the time delay from performing non-invasive imaging would have either put the patient's life at risk from the anterior MI, or led to considerable potential long term co-morbidity associated with significant myocardial damage.

Thirdly, several case reports document type A aortic dissection in combination with AMI requiring emergency surgery [14–19], but to our knowledge this is the first case documenting use of a guide catheter to splint open the dissection. This allowed anterograde blood flow through the left coronary circulation limiting myocardial damage. However, it is important to highlight that catheter manipulation in patients with aortic dissection must be performed with great care due to the risk of cannulating the false lumen and propagating the dissection.

Other techniques used to relieve LMS obstruction include implantation of a coronary stent. Implantation of a stent however, needs to be considered carefully as despite securing LMS patency long term, it will require early instigation of dual antiplatelet agents in the post-operative period, irrespective of whether or not a bare metal stent or drug-eluting stent is used, which may increase post operative bleeding risk if surgery is performed.

Finally, one should remember that there are a number of other causes for ECG changes consistent with acute myocardial ischemia. Often, activation of the PPCI and acute intervention occurs without a thorough history and clinical examination in order to limit door to balloon times. It is therefore likely with the growth of PPCI that we will come across these more unusual presentations and be ready to treat them appropriately.

Conflicts of interest

None to declare.

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